AT&MS Division

Technology Development in the New NASA

NGST Annual Technology Challenge Review
Goddard Space Flight Center
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Advanced Technology & Mission Studies Division

CHARTER

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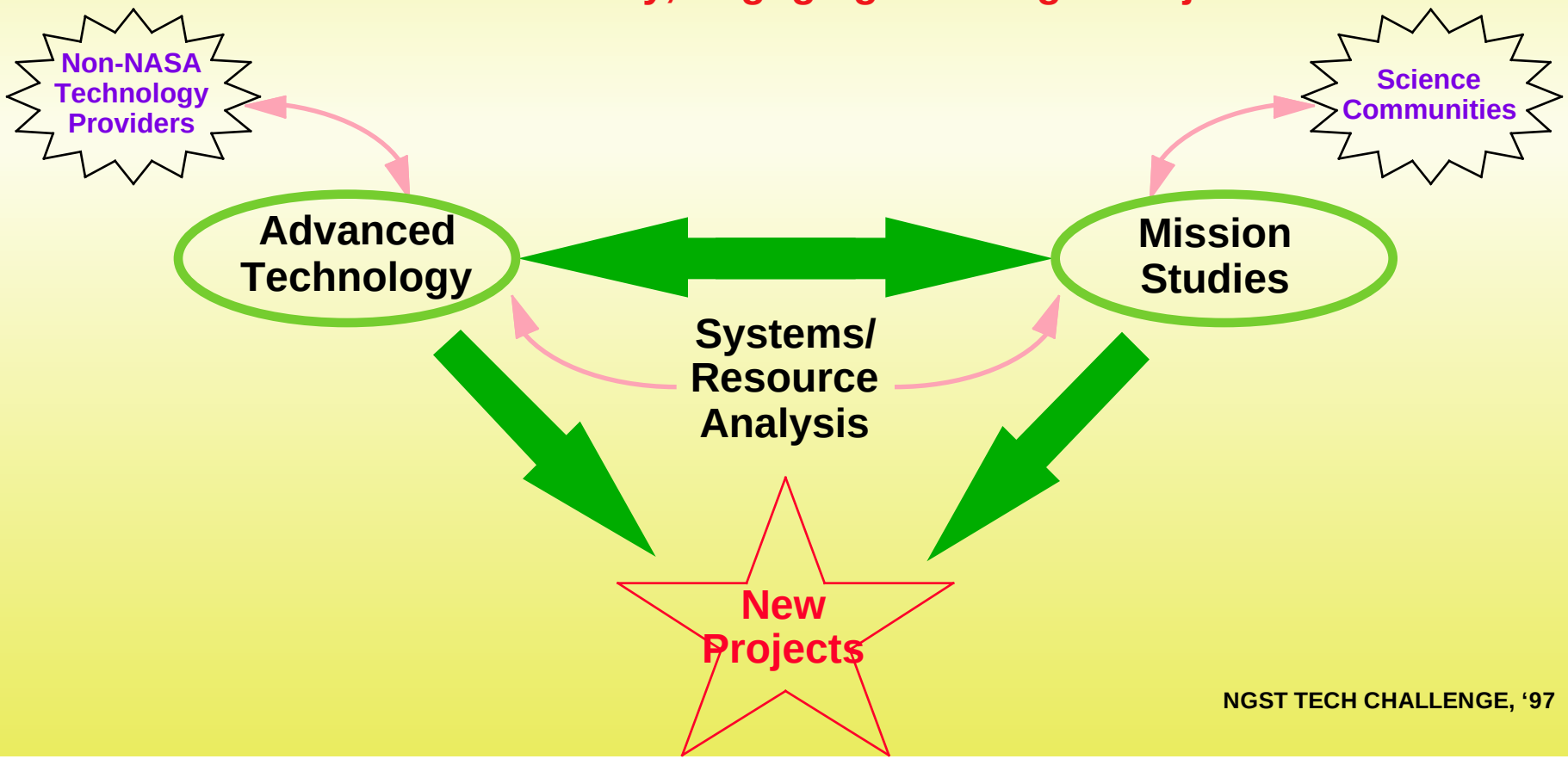
Combining Mission Studies and Advanced Technologies Development With Systems and Resource Analyses to Enable Revolutionary, Engaging New Flight Projects

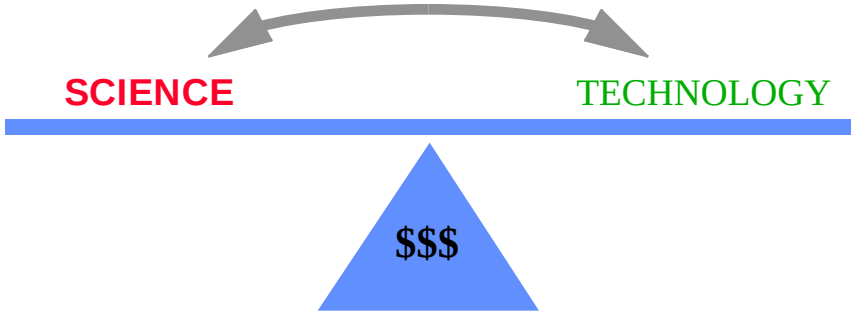


NGST TECH CHALLENGE, '97

Management Process Vision

To Be the Owner of a Well Documented and Openly Accessible Process That:

- **Inspires the *Technology Community* With the Excitement and Challenges of Space Science**
- **Expands the Imagination of the *Space Science Community* With the Revolutionary Inventions of Technologists**
- **Prudently Applies *Resources* to Answer the Fundamental Science Questions With Revolutionary Technology Approaches**



PREAMBLE

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Every Post-mortem and "lessons learned" study,

.....every NASA Program Management training course ever offered,

.....every external review of NASA's development programs

has stressed the need to

ADEQUATELY FUND PRE-DEVELOPMENT

to

RETIRE THE RISK OF TECHNOLOGY DEVELOPMENT

- **And now, (finally!) the President's FY1998 budget for OSS has provided us with the tools to BEGIN to do this.**
- **However, we must PLAN this technology development activity very carefully, to wit:**
  - **Indentify and exploit common requirements across themes & enterprises**
  - **Make maximal use of other NASA funding sources**
  - **Develop leveraging partnerships with non-NASA technology providers**

Technology Will Enable Low Cost Missions

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- **Low Cost Missions Are Vital to the Survival of Space Science and to the Nurturing of a Vital Space Science Community**
- **New Technology Is Essential Because:**
  - **NASA Must Recover Its Function of Innovating, Exploring, and Pioneering**
  - **Savings From Use of Advanced Technology Will Exceed the Cost of Its Development, If Investments Are Chosen Judiciously**
    - **Example: New, Low-Power VLSI Permits Mass Savings Which Can Then be Allocated to Risk Reduction (Such As Radiation Shielding or Added Redundancy)**

NEW ROLE OF TECHNOLOGY DEVELOPMENT
(Chief Technologist, 1/97)

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- **Elevates Technology from "Problem Solver" to "Driver"**

OLD	NEW
Science Goals and Objectives define Missions which use proven Technology for enhancement	Science Goals and Objectives are expanded by the vision of advanced Technology which then enables imaginative Missions

- **Enterprises Will Develop and Integrate Technology for their MIssions**
  - **Balance Near, Mid, and Long Term Needs**
  - **Conduct Advanced Concept Studies**
  - **Adopt Revolutionary Architectures and Systems**
- **Common Cross-cutting Technologies Maintained by OSS (Code SM)**
  - **Requirement: Strong Core Capability Across Enterprises**
- **Broad-based Industry Benefit From Long-range NASA Investment**
  - **NASA: >3 years; Industry: 1-3 years**
- **Office of the Chief Technologist Established to Provide Integrated "Corporate" Leadership**

Technology Readiness Levels*

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Basic Technology Research:

Level 1: Basic principles observed and reported

Research to Prove Feasibility:

Level 2: Technology concept and/or application formulated

Level 3: Analytical and experimental critical fundtion and/or proof of concept

Technology Development:

Level 4: Component and/or breadboard validation in laboratory environment

Technology Demonstration:

Level 5: Component and/or breadboard validation in relevant environment

Limit of Technology Funding →

Level 6: System/subsystem model or prototype demonstration in relevant environment (ground or space)

System/Subsystem Development:

Level 7: System prototype demonstration in a space environment

System Test, Launch, and Operations:

Level 8: Actual system completed and "flight qualified" through test and demonstration (ground or space)

Level 9: Actual system "flight proven" through successful mission operations

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*** NASA Integrated Technology Plan, 1991**

New Vision for Implementing Space Science Missions

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CHARACTERISTICS OF CURRENT MISSIONS	REVOLUTIONARY EXPANDING VISION
Planetery Remote Observation	Virtual Presence
Planetary Reconnaissance	Detailed In Situ Exploration
Only Single S/C Missions	S/C Constellations
Heavy, Complex S/C	Small Modular Sciencecraft
Data Collection	Information Products
Technology to Enhance Performance	Technology to Enable Imaginative Missions
Contracting	Partnerships
Labor-intensive Ground Control	Autonomous Spacecraft Control
Risk Avoidance	Risk Management
Conservative Designs	Rapid Infusion of New Technology

Technology Development in the New NASA

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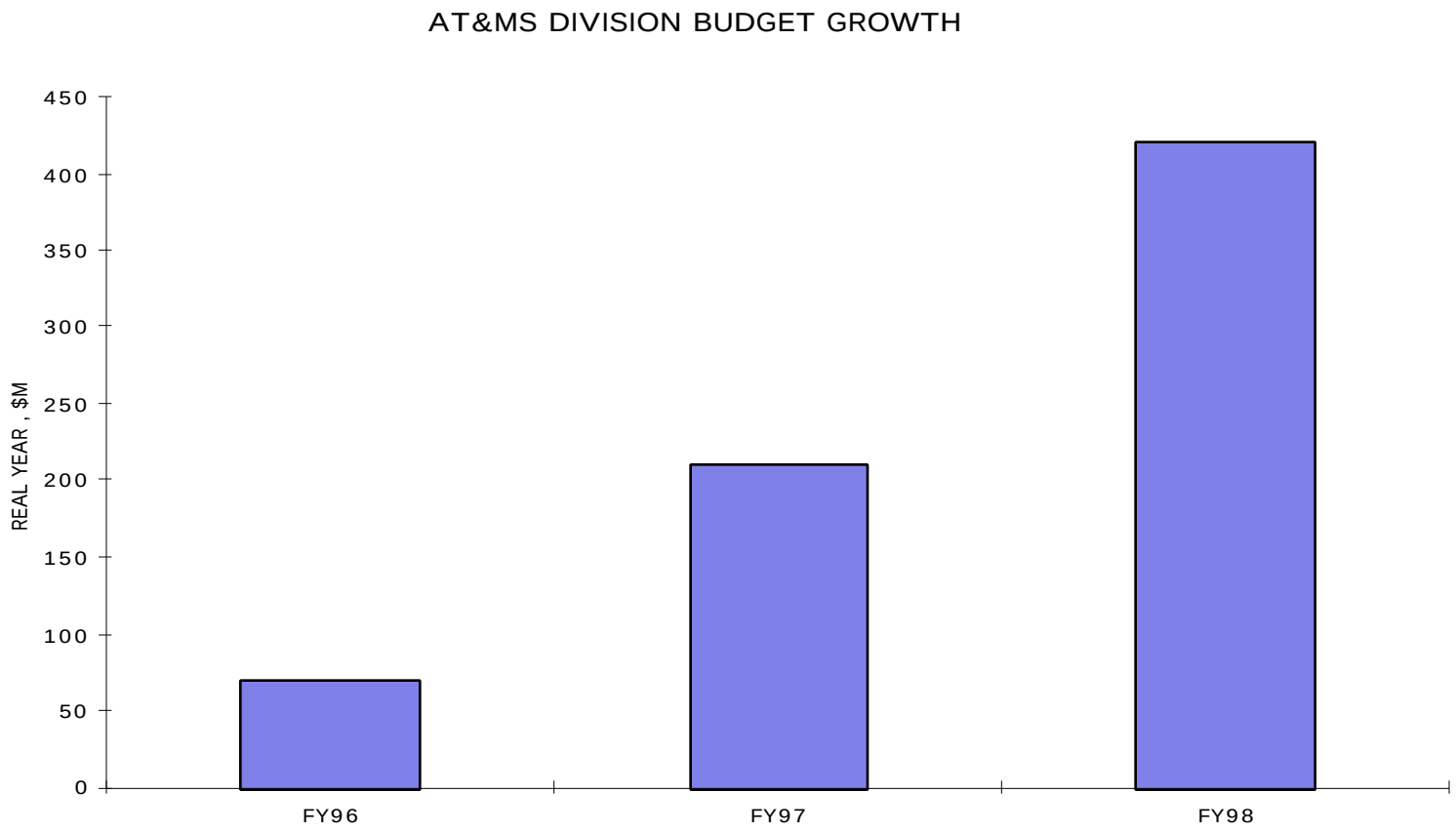

Advanced Technology & Mission Studies
FY1998 Budget

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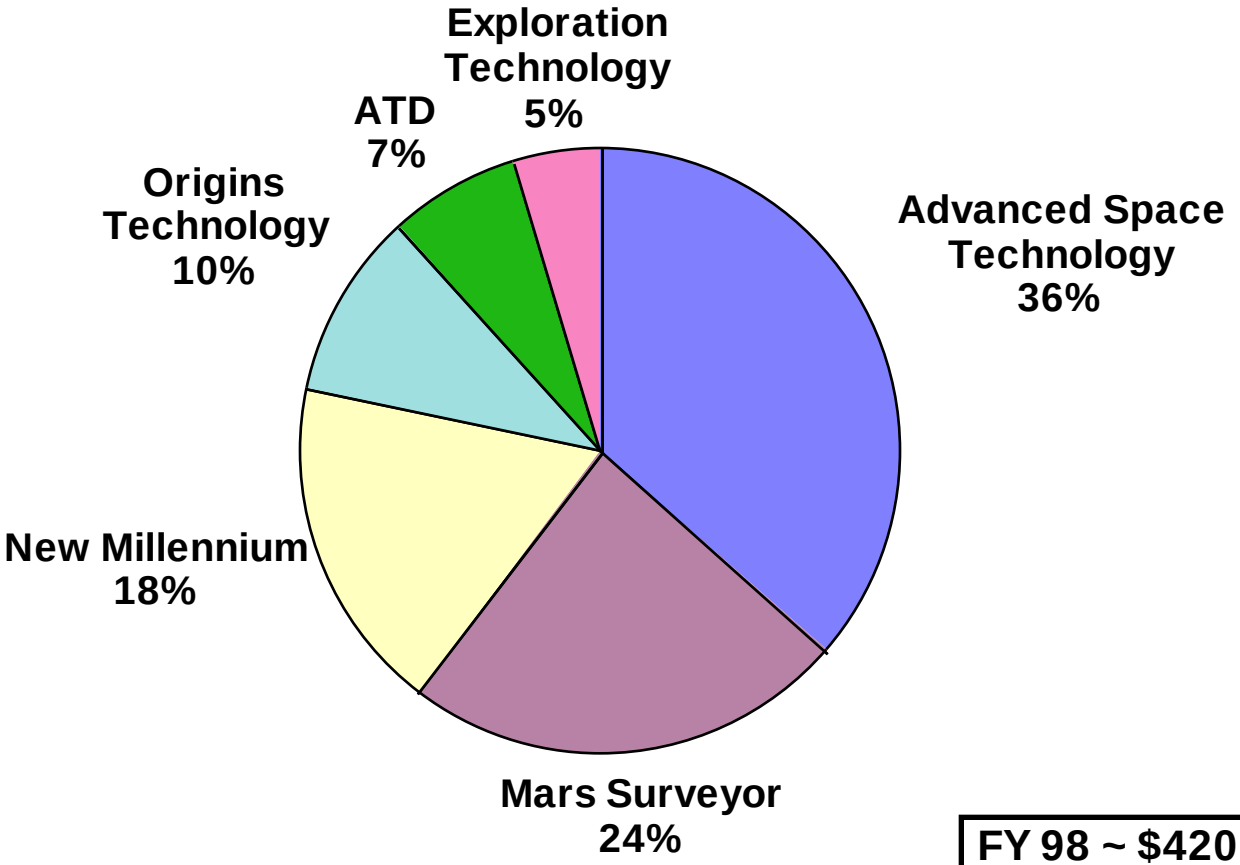

FY 98 ~ $420M

NASA Technology is Widely Distributed Among Enterprises

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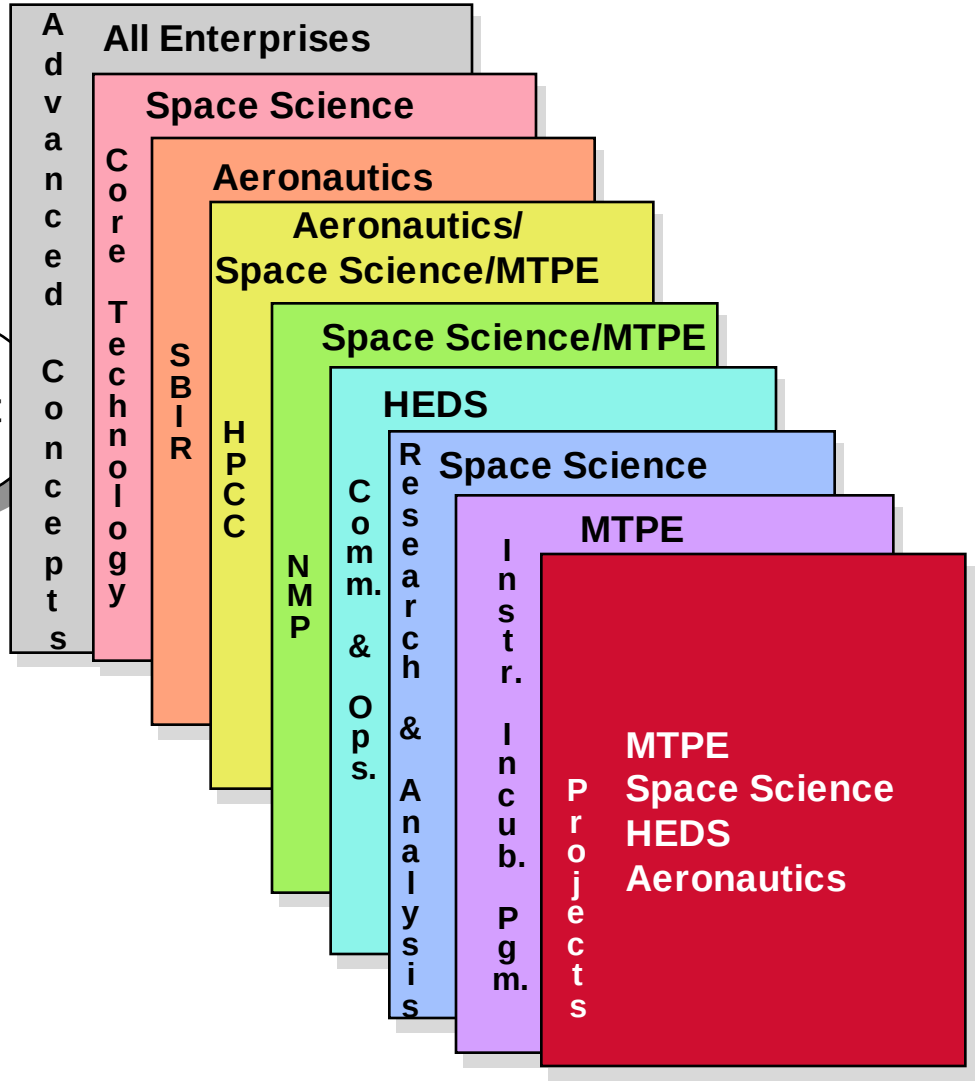
Science Vision & Needs

Technology Strategy Planning

Technology Development Integration



Context for the NASA Crosscutting Technology Program

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MAXIMIZE INVESTMENT PAYOFF
BY AVOIDING DUPLICATION
THROUGH COOPERATION,
LEVERAGING, PARTNERSHIPS

Billions	International (Japan, Europe, Russia, Canada, etc)
Billions	Industry (Info Tech, Comm, Robotics, Avionics, etc.
Billions	Industry IR&D
Billions	Non DoD Agencies (NSF, DOE, etc)
Billions	DoD Classified R&D
Billions	Other DoD (DARPA, Projects, etc.
~$350M	DoD Space Technology (Laboratories)
~$100M	NASA Reimbursable Technology Development
$850M	Relevant NASA Aeronautics Technology (RLV, Base, etc)
$110M	HPCC
$125M	SBIR
~$250M	Code SD Projects (Incl. NMP)
~$200M	Code SR grants (~$25M Technology?)
$150M	**Code SM (was Code XS)**

Instruments
Spacecraft Systems
Communications
Autonomy & Information Mgmt
Telerobotics

Strategy for Concurrent & Distributed Management

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HORIZONTAL

(Cross-Enterprise)

- **Joint Enterprise Strategy Team (JEST)**
  - **Chaired by Director of Code SM**
  - **Membership: Technology Lead from Each HQ Enterprise Office (S,Y,M,U,R) and Directors of Center Technology Offices**
  - **Charter: Policy, Coordination, Oversight, Conflict Resolution**

VERTICAL

(HQ - Centers: Mission Requirements & TechnologyDevelopment)

- **Joint Planning Teams (JPT's)**
  - **Vertically Integrate HQ and Center Functions - all "Levels" have a role**
  - **One JPT for Each Technology Element (e.g. Telerobotics, Communications, Autonomy, S/C Systems, Instruments/Sensors)**
  - **Match Mission Requirements and Technology Assets**
    - **i.e., Organize Execution of Mission Studies; Assure Availability of Enabling Technology**

Core Technology is Managed Through a CROSS-ENTERPRISE PROCESS

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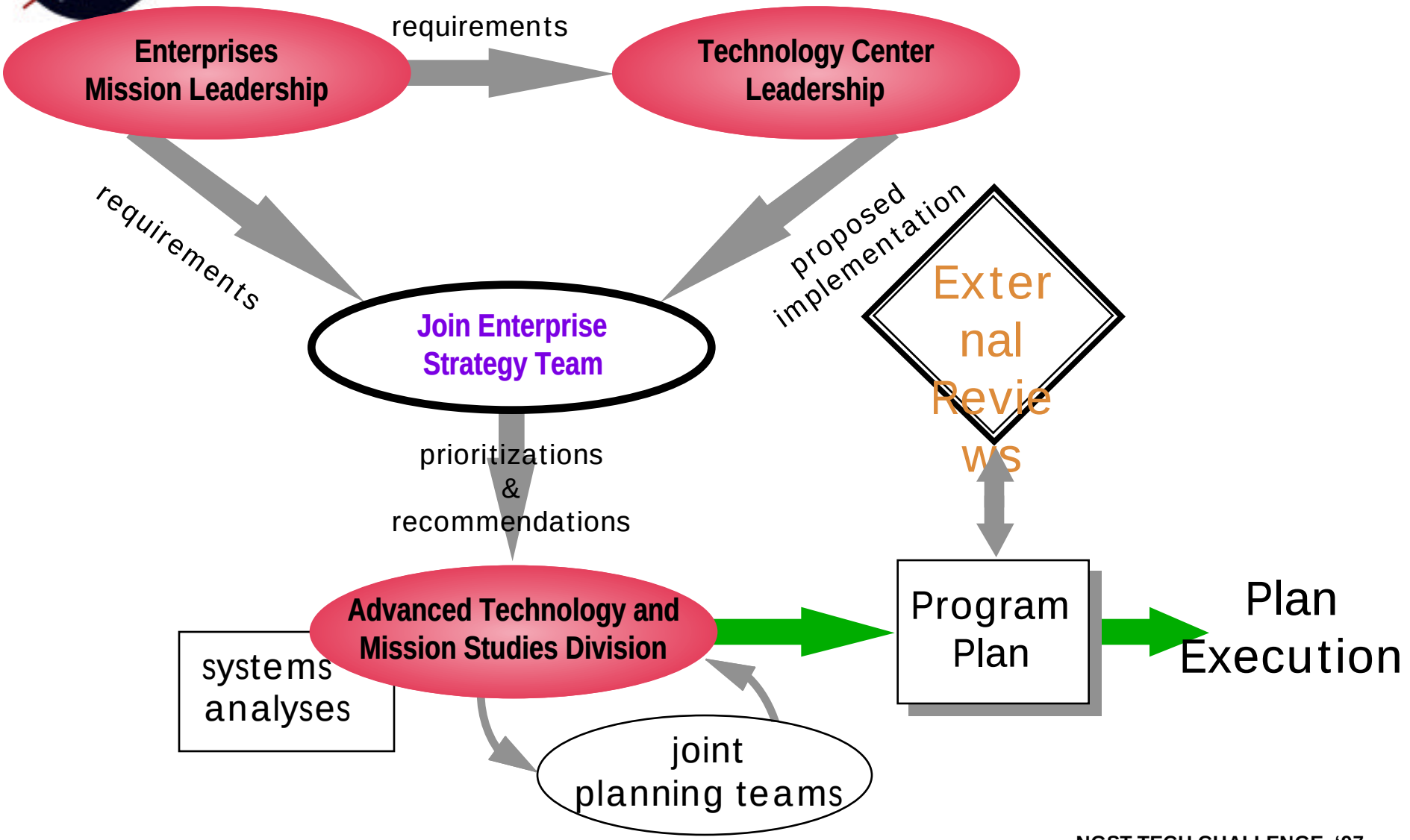

SPACE SCIENCE STRATEGIC PLANNING and INTEGRATED TECHNOLOGY PLANS

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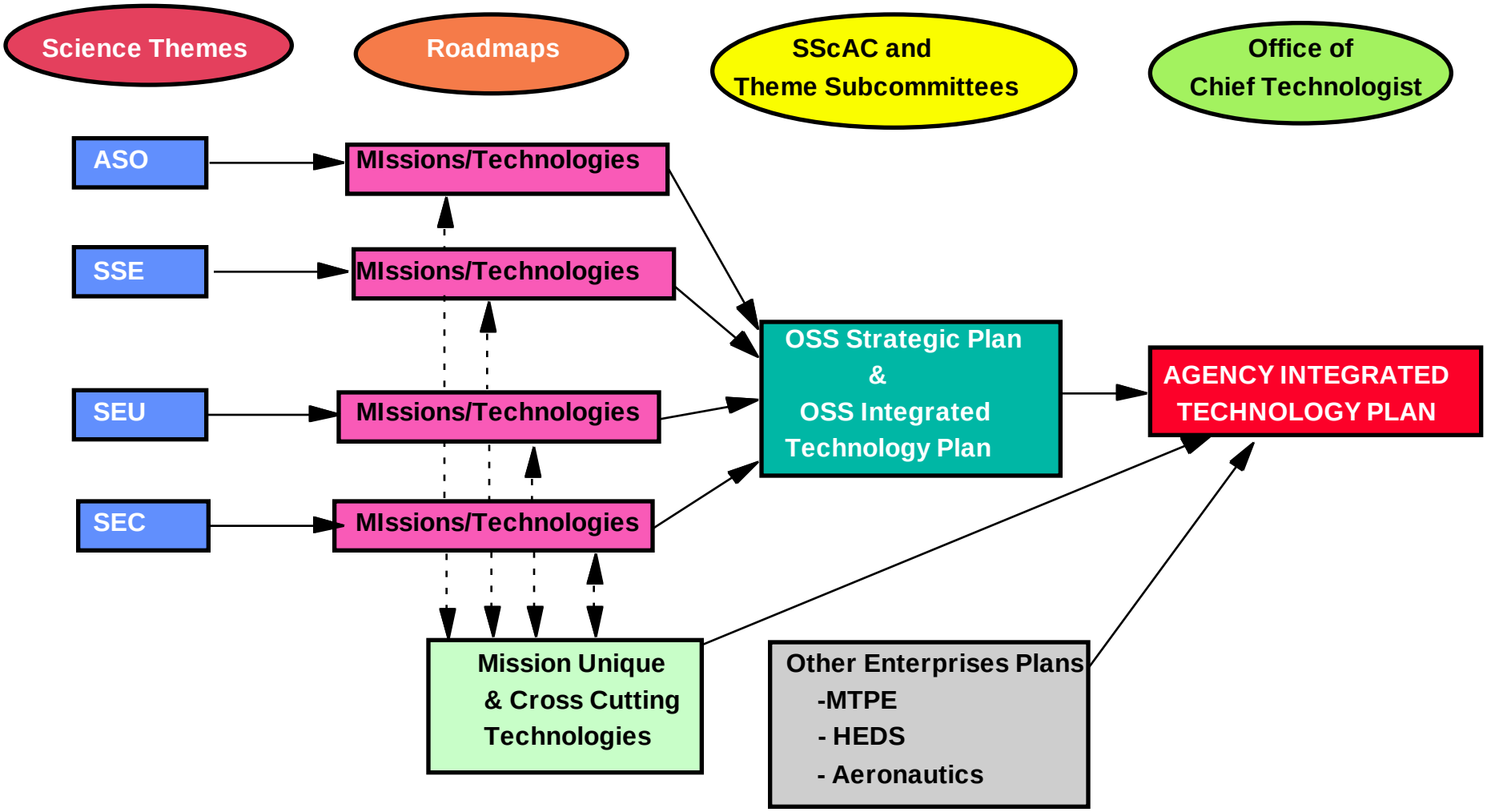

The Langley Study:
Technology Development Implications of OSS Theme Roadmaps

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- A Langley Research Center-Led Team Has Reviewed the Theme Mission and Technology Roadmaps (As Well As a Lot of Supporting Documentation)
- Reviews Were Augmented With Conversations and Interviews With Key Personnel From All Four Themes
- Of Particular Interest Was their Collation of Roadmap-Stated Technology Needs
  - They Created a Matrix of Theme Missions vs. Identified Needs
  - We Have Begun a Detailed Refinement of These Matchups

The Langley Study:
What Was Done and Not Done

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WHAT WAS DONE

- Reviewed cost estimates by looking at the constituent pieces to make sure they were all there and documented those that were not included
- Looked at the groundrules and assumptions to identify and document drivers and differences
- Looked at the maturity, fidelity, and optimism of the estimates and when possible, provided comparative data.,
- Collected facts and presented them so that equivalent assessments could be made across missions and themes.
- Approached this from a non-advocacy role.
- Provided opportunities to Themes to make sure findings were correct

WHAT WAS NOT DONE

- Did not redo cost estimates of proposed missions or “validate” them
- Did not interpret data or make value judgments.
- Did not attempt to place individual missions or other areas in any preferential light

The Langley Study:
WHAT THE ROADMAPS ARE SAYING ABOUT TECHNOLOGY*

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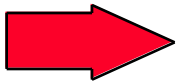
- Technology Development is key to meeting the objectives of this strategic endeavor
- Opportunities for synergy are abundant (sometimes only apparently so)
- New Millennium and "traditional" ATD lines are expected to contribute to all themes and are likely to be oversubscribed
- Mission cost estimates assume technology development will be completed under various AT&MS programs prior to start of Phase C/D
- Many proposed missions require revolutionary enabling new technologies
- Ultimately, mission implementation schedules will be driven by technology developments
- Technology needs are not always consistently presented
- Criticality of technology (i.e. enabling versus enhancing) not always identified

This Drives the Integrated Technology Planning Effort



Currently unable to correlate technology budget availability with budget demand

* "Roadmap Integration Review", M. Saunders, 4/25/97 (My Italics Added)

Assumptions and Process

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- **Data was assembled over past year from roadmap teams, missions, technologists**
  - **We have begun to assess these Roadmap requirements for specificity, funding status, and criticality**
  - **Technology status was assessed in concert with technology community and mission customers**
  - **Included assessment of both NASA and non-NASA technology programs**
- **Our Interim product will identify challenge areas and plans to resolve issues**
- **Final products will be "three-way contracts" between technology providers, mission users, and Headquarters program (resource) executives**

CATEGORIZATION OF IDENTIFIED TECHNOLOGY NEEDS

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- **QUALITY OF IDENTIFIED TECHNOLOGY NEED STATEMENT**

Category a	**Properly defined; need date, needed maturity**
Category b	**Satisfactorily defined; vague need date or maturity**
Category c	**Poorly defined; vague or no need date or maturity**

- **STATUS OF IDENTIFIED TECHNOLOGY ACTIVITY (if any)**

		Aligned with need
Blue		**Performance and schedule are achievable** **Funding appears to be adequate**
Yellow		**Known performance or funding is inadequate** **Remediation is underway**
Red		**There is no activity, or there is a known shortfall** **Remediation is not possible with current plan**

- **CRITICALITY TO MISSION**

Category 1	**Critical path impacting/enabling**
Category 2	**Highly enhancing; critical path impacting**
Category 3	**Highly enhancing; non critical path impacting**

Space Science Missions & Technology Needs

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Theme	ASO ← →			SEU								SEC													SEC / SSE			SSE																		
	SIM	TPF	NGST	FIRST	Planck	GLAST	HTXS	LISA	ARISE	ACCESS	OWL	Solar-B	STEREO	Mag. Multiscale	Solar Probe	Global Elec.	Mag. Constell.	Solar Wind Sent.	Stereo Mag. Imag.	ITM Dynamics	Meso. Coupl.	High E. Sol. Phys.	Solar Pol. Img.	Mars Upp. Atmos.	Jupiter Pol. Orb.	Mercury Orbiter	Europa Orbiter	Pluto	Champollion	MSP-01	MSP-03	MSR-05	Mars >2005	CNSR	Jupiter Multiprobes	Europa Lander	Io Volcano Obs	Neptune Orbiter	New Comet Encounter	Titan Atm./Surface	Venus Atm./Surface
Technology																																												
Power	**Power**																																											
Adv. radioisotope power source																								1b		1a	1a								1b	1c	1b		1c					
Adv. power mgt & distribution															2b		1b							2b	2b	2b	2b	2b	2b	2b	2b	2b			2b									
Advanced solar arrays			2a												1a									2b		2b								1a	2a	1a		2a		2b				
Near-Sun power															1a											1a																		
High density secondary batteries															3a		1b												1a	1a	1a	1b												
Propulsion	**Propulsion**																																											
Ascent propulsion																														1a	1c				1b								
Low mass/long life ACS thrusters			1b												2a												2a	2a																
Adv. biprop systems & components																									2b		2a						2b		2b	2b	2b		2b	2b			
Adv monoprop syst and comp													3b	3b	3b	3b	1c										3a	2a																
Adv. SEP								1b							2a									2b	1a	1a			1a						1a		1a	1a	1a					
Solar sail															3b		2a					1b																	2b					
Spacecraft Avionics	**Spacecraft Avionics**																																											
High density integrated microelectronics															1a										1b	1b	1a	1a	1a	1a	1a	1a	1b	1b	1b	1b	1b	1b	1c	1c	1c		
Microelectronics/Rad hard components			1a												1a		2b							1b	1b	1a	1a	1a	1a						1b	1c							
Rad hard packaging																	2b							3c	1c	1c	1a	1a	1a						1c	1c							
High temp electronics																										2a																1c		
Low Temperature Electronics																												3b		3b	3b	3b	3b	3b	3b	3b		3b	3c	3c			
Solid State Data Storage			1a																											1a	1a	1a	1a										
Low power data bus															1a												1a	1a	1a							2b								
Adv. star tracker			1a												1a												1a	1a	1a															
Precision μ-gyro								2b							1a												1a	1a																
Prec. self-pointing for science								1b																			1a	1a	1a															
Prec. multi-s/c format. flight		2c						1c						1b		1b	1b																											

Space Science Missions & Technology Needs

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Theme	ASO ↔			SEU								SEC											SEC / SSE			SSE																
	SIM	TPF	NGST	FIRST	Planck	GLAST	HTXS	LISA	ARISE	ACCESS	OWL	Solar-B	STEREO	Mag. Multiscale	Solar Probe	Global Elec.	Mag. Constell.	Solar Wind Sent.	Stereo Mag. Imag.	ITM Dynamics	Meso. Coupl.	High E. Sol. Phys.	Solar Pol. Img.	Mars Upp. Atmos.	Jupiter Pol. Orb.	Mercury Orbiter	Europa Orbiter	Pluto	Champollion	MSP-01	MSP-03	MSR-05	Mars >2005	CNSR	Jupiter Multiprobes	Europa Lander	Io Volcano Obs	Neptune Orbiter	New Comet Encounter	Titan Atm / Surface	Venus Atm / Surface
Technology																																									
Inertial sens. / drag free control								1a																																	
Vibration free reaction wheels			2a																																						
Structures/Materials	**Structures/Materials**																																								
Multifunctional structures																	1c														3c	3c					2c				
Large lightweight deployable structures		2b	1b						1a		1c							2b					2b																		
High temp thermal shielding / materials															1a																				1a					1c	
High Efficiency Insulation															3a														1a	1a											
Advanced Composite Structures			1b										3a	3a		3a	2b																									
Space Environmental Effects	**Space Environmental Effects**																																								
Mars Environmental Model																															2b	2b									
Planetary / small body surface models																												2c			2b	2b	2c						2c	2c
Thin film materials / contamination models		2c	2c																																						
Sun / Earth environmental models													2b	2b		2b	2b		2b	2b	2b	2b																			
Landers, Penetrators, & Sample Return	**Landers, Penetrators, & Sample Return**																																								
Automated Rendezvous & Docking																															1b	1b	1b								
Autonomous feature tracking / prec. landing																													1a	1a	1a	1c	1b		1b				1c	
Landing / anchoring / penetrators																												1a			1a	1c	1b		1b				1c	
Sample acquistion																												1a	1a	1b	1b	1c	1b		1b				2c	
Sample Cooling, Preserv. & Return																												1a			1b	1c	1b							
Sample Transfer & Handling																												1a			1b	1c	1b						2c	
Systems Engineering & Test Tools	**Systems Engineering & Test Tools**																																								
Integrated Microspacecraft Technology															1a		1b										1a	1a	1a							1c		1c		2c	2c
Low cost multiple S / C manufacturing tech.														1c																											
Thermal Control	**Thermal Control**																																								
Advanced Thermal Control		1b	1b												1a									3b	3b	1b					3c	3c					2b				1c

NGST TECH CHALLENGE, '97

Space Science Missions & Technology Needs

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Theme	ASO ↔			SEU								SEC												SEC / SSE			SSE														
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Technology																																								
Aeroassist / aerobrake / aerocapture																								2b					1a	1a	1a	1a	2c			1a		1b	
Sensor/Detector Technology	Sensor/Detector Technology																																							
Low noise submm receievers to 3 THz				1a																																				
Low noise cryo amplifiers to 200 GHz				1a	1a																																			
Bolometer arrays to 1 THz				1a	1a																																			
Uncooled Submm receivers beyond 600 GHz																												1a													
Starlight nulling focal plane	1a	1a																																						
VIS / IR 1K detector arrays: 0.5-20µm		1b	1a																																					
IR / Vis detector : On chip ADC																									1a	1a	1a	1a	1a	1a					1a						
Solar blind UV arrays															1b										1b		1b														
Uncooled IR arrays: On chip ADC																												1b	1b	1b			1b							
Broadband 12-16µm IR arrays																														1a	1a				1a					
X-ray microcalorimeter arrays							1a																																	
High-energy Calorimetry						1a																																		
High spec. res. X-ray detector							1a																																	
X-ray diffraction gratings							1a																																	
High energy,thick CZT detectors							1a																																	
Double-sided Si detectors						2a																																		
High power stabilized laser								1a																																
Cosmic ray Si detector arrays										1a																														
Photon detectors, readout, trigger											2b																													
Raman Spectrometer																													2c	2c	2c		2c							
Tuneable diode spectrometer																													1b	1b	1b	1b	1b							1b
Mini geochemical lab																													1b	1b	1b		2c							1c
Mini geophysical lab																																1c			2c				1c

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Technology																																											
Mini / micro mass spectrometer																											1c			1c	1c	1c		1b							1c
Organic sensors																													1a	1a	1a		1b								
Mini Radar sounder																										1c					1c	1c										
Mini alimeter																										2c																
IR / FIR spectrometer																													1a	1a											
Integrateed space physics Instrument															1a			2b							1a																
UV / Vis imaging spectrometer																									1a	1a	1a							1a							
Mini vector magnetograph												1b			1c																										
Mini X-ray / EUV camera															1c																									
Coronograph / Corona Chromosphere Imag.													2b		1c																									
Coronal Mass Ejection Tracker													2a																											
Micro Solar Wind / Particle Detector													2a																											
Integrated Solar Wind Science Package													2a																											
Micro / lt. wt. low pwr. E-field detectors														3b		2a	1c																							
Ion / Electron Spectrometers incl. time of flt														3b																										
Inegrated Ion,Neutral,Wind Spectrometer																2a																								
Mini Fabry Perot Interferometer																2a																								
Micro Particle Spectrometer																	1c																							
Micro RF Sounder (10-100 MHz.)																	1c																							
Micro Auroral Stereo Imagers																	1c																							
2-D Spectrographic Focal Plane Detectors																			2b	2c	2c			2b																
Telescopes/Interferometers	**Telescopes/Interferometers**																																							
Lgtwgt Vis / IR 8m reflector			1a																																				
25m deployable RF antenna									1a																															
Cold 4m submm reflector				1a																																			

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Technology																																										
Extendable optical bench				1b			1b																																			
X-ray high-res. imaging, optics							1a					1a																															
High energy reflecting optics							1a																																			
Cryo-optical mechanisms				1b																																						
Active optical sensing and control	1a	1a	1a																																							
Nanometer and sub-nanometer metrology	1a	1a	1a					1b																																		
Deformable mirror / optics			1a																																							
Low jitter fast steering mirror			1a																																							
Digital mirror / optics			2a																																							
Precision structural deployment	1a	1b	1a																																							
Vibration isolation / supression	1a	1b	1a																																							
Integrated modeling of optical systems	1a	1a	1a																																							
Cryogenics/Coolers	**Cryogenics/Coolers**																																									
Vibration free cryocoolers		1a	1a	1a	1a		1a		1a												1a	1a																				
On-board Autonomy	**On-board Autonomy**																																									
Adv. fault protect.			1b												1a												1a	1a	1a														
On-board engin. data summ.															1a												1a	1a	1a														
On-board planning & sched.			1b												1a												1a	1a	1a														
Smart executive			1c												1b												1b	1b	1b														
On-board nav.																											1a	1a	1a	2b	2b	1b		1b								
On Board Sc. Data Analysis & Compression													3a	3a		3a	1c																									
Autonomous feature detection and tracking														2b																						1b					
On-board event form. & bgrd reject.			1c								1c																														
Mission Operations & Data Analysis	**Mission Operations & Data Analysis**																																								
Autonomous ops	1a	1b	1c											2b		2b	2b		1b																1b							

NGST TECH CHALLENGE, '97

Space Science Missions & Technology Needs

AT&MS Division

Theme	ASO			SEU								SEC												SEC / SSE			SSE																	
	SIM	TPF	NGST	FIRST	Planck	GLAST	HTXS	LISA	ARISE	ACCESS	OWL	Solar-B	STEREO	Mag. Multiscale	Solar Probe	Global Elec.	Mag. Constell.	Solar Wind Sent.	Stereo Mag. Imag.	ITM Dynamics	Meso. Coupl.	High E. Sol. Phys.	Solar Pol. Img.	Mars Upp. Atmos.	Jupiter Pol. Orb.	Mercury Orbiter	Europa Orbiter	Pluto	Champollion	MSP-01	MSP-03	MSR-05	Mars >2005	CNSR	Jupiter Multiprobes	Europa Lander	Io Volcano Obs	Neptune Orbiter	New Comet Encounter	Titan Atm / Surface	Venus Atm / Surface
Technology																																										
Sci. data process	1a	1b	1c												2b									2b	2b	2b																
Data assim. and visualization													2b	2b		2b	2b																									
Planetary Telerobotics Technology	Planetary Telerobotics Technology																																									
Aerobot Technology																																2b							1c	1b
Adv. rovers																													1a	1a	1b	1b									
Planetary Subsurface Systems																																			1c						
Small body mobility																																	2b								
Space Communications	Space Communications																																								
Inter S / C Ranging & Communication														3a		3a	1c																								
Small, low pwr. prec. time ref'ng															2c												2a														
Data acquis. from constell.														3b		3b	1c																								
High effic., low mass SSPA									2a				2a		2a									2a	2a		2a	2a			2a		2a	2a	2a	2a					
Adv. deep space transponders									1a						1a									1a	1a	1a	1a	1a	1a			1a		2a	2a	2a	2a					
Planetary local communications systems																													1a	1a				2b							
Adv. field progm. gate array (rad hard)															1a												1a	1a	1a												
Telecom w / plasma scintillations															1b																										
High Data Rate > 1 Gb / sec			2b						2b																																
Optical Communications			3b																																		2b				
* Note: the numbers indicate only those missions that identified technologies were needed; many other missions, particulary far term missions, will benefit from these technologies.																																									

Current/Next Steps

AT&MS Division

- Adjust Mission Set and Timeframe As Result of Breckenridge Conference
  - NOTE: Breckenridge Eliminated Many of the Missions Listed on Top of Last Set of Charts...See "Space Science Enterprise Strategic Plan" to Be Published September 1997 for Updated List of Surviving Missions.
- Continue Alignment Efforts
  - Improve Quality of Requirements Statements
  - Determine Status of Technology Readiness
  - Determine Multimission Applicability of Each Technology
- Identify and Conduct Technology Trades Where There Are Multiple Options
- Complete Risk and Benefit/Cost Assessments
- Determine Technology Investment Portfolio for OSS 2000-2004 Plan

COMPILE A COMPREHENSIVE OSS INTEGRATED TECHNOLOGY PLAN AND SUBMIT AS PART OF THE AGENCY ITP

SUMMARY: Steps to an OSS Integrated TechnologyPlan

AT&MS Division

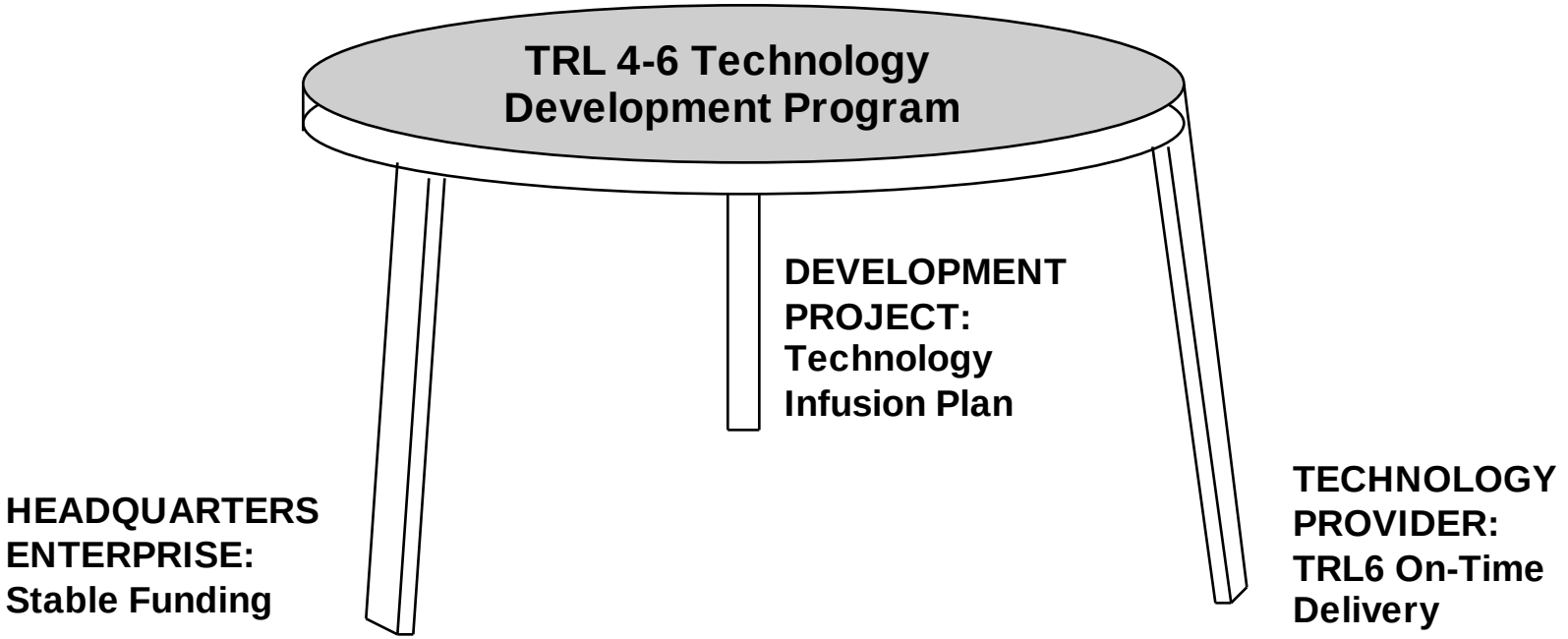
- Focus on TWO CLASSES OF MISSIONS That Will Appear in the New OSS Strategic Plan (Strawman-Approved)
  - (1) FUNDED MISSIONS AND MISSIONS IN FY98 PFP
    - We Will Align a "Just-in-Time" Technology Investment Portfolio to Need Dates
  - (2) MISSIONS "TO BE FUNDED"
    - We Will Design an Early Risk-Retirement Portfolio to Position Missions As Competitors for "Agency Wedge" (Attack the "long tent poles")
- First We Must Eliminate Any Vagueness of Stated Requirements and Need Dates for Enabling and Enhancing Technologies
- We Will Then Optimize Investment Strategy by Various Means, e.g.
  - Exploit Commonality Among Theme and Other Enterprise Needs
  - Seek Synergy With Non-OSS Programs
  - Apply Leverage Through Cooperative Programs With Non-NASA Partners
- We Will Produce a Plan That Incorporates All Verified Demands and All Potential Funding Sources, both NASA and non-NASA
  - If Necessary, We Will Revisit Mission Start Dates to Match Availability of Enabling Technology to the Required Need Dates

THE OPERATIVE PRODUCTS OF THIS PLAN WILL BE THREE-WAY "CONTRACTS" FOR TECHNOLOGY INFUSION

Technology Funding, Development, Infusion (TRL 4-6)
The "Three-legged Stool"

AT&MS Division

- **The Tree-legged Stool Will Collapse If Any One Leg Is Missing:**



- **Implementation: A Three-way "Contract"**

Technology Management in the NEW NASA
CONCLUSIONS

AT&MS Division

- **OSS Is Responsible for Both the Core Cross-Cutting Technology Development Program for the Agency and for Code S Unique Needs**
  - **We Support All Enterprise Technology Needs That Are Not Unique To a Single Enterprise**
- **A Concurrent and Distributed Management Approach Is Used That Incorporates Functions and Expertise At All Levels Within the Agency**
  - **THIS IS WHERE "FAR-OUT" TECHNOLOGY PROPOSALS GET A FIRST HEARING**
- **Synergism With Other NASA and Non-NASA Programs Is Essential**
- **Far-Term, More Speculative Technology Will Be Supported at a Significant Level (~25-30%)**
- **The NASA–Wide Technology Inventory Is Being Developed**
  - **Will Be Linked to DOD and Other Technology Data Bases**
  - **To Be Made Available on the Web Late Summer/Early Autumn 1997**
- **The OSS Strategic Plan, The MTPE Biennial Review and The HEDS Technology Plan (in preparation) Form the Basis For Technology Requirements Upon Which Our Program Is Built**
- **Detailed, Mission-Connected Technology Roadmaps Are Being Developed By Each Enterprise and Integrated to Form An Agency-Wide Plan to be Completed Later This Year**